University of Alberta Library
0 1620 3682067 6

Science 8

Module 1

Mix and Flow of Matter

Home Instructor's Guide and Assignment Booklet 1C

Learning Technologies Branch

Alberta LEARNING

Science 8
Module 1: Mix and Flow of Matter
Home Instructor's Guide and Assignment Booklet 1C
Learning Technologies Branch
ISBN 0-7741-2501-2

The Learning Technologies Branch acknowledges with appreciation the Alberta Distance Learning Centre and Pembina Hills Regional Division No. 7 for their review of this Home Instructor's Guide and Assignment Booklet.

This document is intended for	
Students	✓
Teachers	✓
Administrators	
Home Instructors	✓
General Public	
Other	

You may find the following Internet sites useful:

- Alberta Learning, **http://www.learning.gov.ab.ca**
- Learning Technologies Branch, **http://www.learning.gov.ab.ca/ltb**
- Learning Resources Centre, **http://www.lrc.learning.gov.ab.ca**

The use of the Internet is optional. Exploring the electronic information superhighway can be educational and entertaining. However, be aware that these computer networks are not censored. Students may unintentionally or purposely find articles on the Internet that may be offensive or inappropriate. As well, the sources of information are not always cited and the content may not be accurate. Therefore, students may wish to confirm facts with a second source.

ALL RIGHTS RESERVED

Copyright © 2003, the Crown in Right of Alberta, as represented by the Minister of Learning, Alberta Learning, 10155 – 102 Street, Edmonton, Alberta T5J 4L5. All rights reserved. Additional copies may be obtained from the Learning Resources Centre.

No part of this courseware may be reproduced in any form, including photocopying (unless otherwise indicated), without the written permission of Alberta Learning.

Every effort has been made both to provide proper acknowledgement of the original source and to comply with copyright law. If cases are identified where this effort has been unsuccessful, please notify Alberta Learning so that appropriate corrective action can be taken.

IT IS STRICTLY PROHIBITED TO COPY ANY PART OF THESE MATERIALS UNDER THE TERMS OF A LICENCE FROM A COLLECTIVE OR A LICENSING BODY.

UNIVERSITY LIBRARY
UNIVERSITY OF ALBERTA

Section 3: Working with Fluid Pressure

In this section your student will describe pressure quantitatively and compare the effect of pressure on liquids to the effect of pressure on gases. The student will also see how hydraulic and pneumatic systems utilize fluids under pressure.

Suggested Demonstration: A Flowing Gas

The following is a demonstration you could do for your student in Lesson 1. The demonstration shows that carbon dioxide gas has mass and, therefore, weight. This gas is more dense than air so it can be made to flow down a channel to extinguish a candle flame. This also shows that the gas flows as do other fluids. From this demonstration, students can infer that other gases have mass, weight, and properties of fluids.

If you choose to do this demonstration you will produce carbon dioxide by combining vinegar and baking soda.

Introduction to Students

Gas particles have mass, and gravity affects anything with mass. The weight of an object is the force of gravity acting on the object's mass.

The water in a river stays within the river's banks because the water has mass and weight. If a gas can be made to flow along a channel, then you can conclude that the gas has weight and, therefore, mass.

Prove to yourself that a gas has weight and that different gas particles have different masses by conducting this investigation.

Background Information

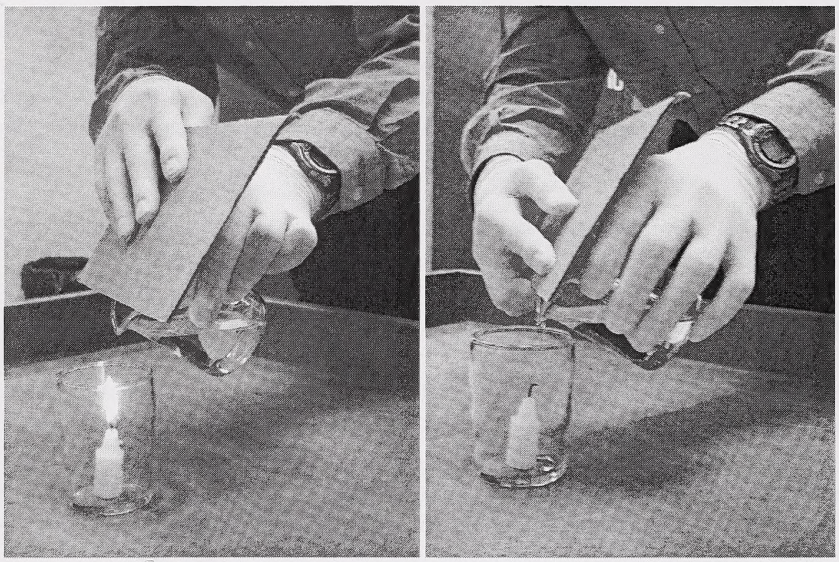
Vinegar is a dilute form of acetic acid. When it is mixed with baking soda, carbon dioxide gas is released as one of the products. Carbon dioxide is also a product of combustion, or burning, and does not support combustion like oxygen. Carbon dioxide is a colourless, odourless gas. When a candle flame burns, the oxygen in the air supports the combustion of the candle wax.

Materials You Will Need

- a 250-mL measuring cup
- a short, wide-mouthed beverage glass
- a short candle—3 to 4 cm tall
- a 15-mL measuring spoon (1 tablespoon)
- a 20.5 cm × 12.5 cm file card—a postcard or a similar shape cut from a cereal box

- vinegar
- baking soda
- a wooden splint or long wooden matches
- latex gloves
- safety goggles

Procedure to Follow



Step 1: Pour approximately 100 mL of vinegar into the measuring cup. Add 15 mL or one level tablespoon of baking soda. Cover the measuring cup with the file card to allow air to escape through the spout.

Step 2: Stand the candle in the beverage glass and light it with the wooden splint. Let the candle burn until it burns steadily.

Step 3: When the vinegar and baking soda mixture stops bubbling, slowly pour the carbon dioxide gas down the side of the beverage glass. Take care not to pour the gas directly onto the candle and not to pour the liquid into the glass. Check the illustration.

Discussion Ideas

Describe the candle flame before you pour the gas into the glass. The flame goes up from the candle wick.

Describe the candle flame as you poured the gas into the glass. The flame became smaller and was extinguished.

What happened to the air in the beverage glass? The carbon dioxide ran down to the bottom of the glass and displaced the air that was in the glass.

How do you know that you poured carbon dioxide into the beverage glass? The flame went out when the carbon dioxide displaced the air that was in the glass. The air supplied the oxygen needed for combustion.

What can you conclude? Carbon dioxide has mass and weight. Other gases, including air, also have mass and weight.

The following materials will be needed to complete this section.

Section 3: Lesson 1

- a large screwdriver
- a tape measure or a ruler
- two empty balloons
- a hook or a thumbtack
- a metre-stick or a dowel of the same length
- a pair of scissors
- a sharp pin
- string
- one wide-mouthed jar, such as a 2-L peanut-butter jar
- one sandwich bag
- duct tape or other adhesive tape

Section 3: Lesson 2

- two modified syringes—different sizes, one with a tip cap
  A cork or an eraser with a hole partway through it may be substituted for a tip cap.
- a short piece of plastic tubing
- a beaker or water glass
- a ruler
- a 100-mL graduated cylinder
- two elastic bands
- a plastic bottle with a narrow spout
- a pail
- other approved materials and equipment based on the student's individual design

Suggested Answers

Section 3: Lesson 1

15. When properly sealed it is impossible to pull the bag out of the jar without making a hole in it. As students pull up on the bag, the pressure inside the jar is reduced as the volume increases. The higher atmospheric pressure on the outside pushes the bag into the jar with a force high enough to prevent students from pulling the undamaged bag out.

16. Students would be able to lift the bag a little further out of the jar. The atmospheric pressure at 3954 m is reduced by about one-third from sea level—this would make it slightly easier to lift the column of air above the jar.

Section 3: Lesson 2

5. Textbook questions, steps 3 and 4 from "Procedure," page 79:

Step 3: The balloon inflates as you press the bottle.
Step 4: The sides of the bottle bulge out as you press the balloon.

Textbook questions 1 and 2 from "What Did You Find Out?" on page 79:

1. The water squeezed out of the bottle—this makes the balloon arm move.

2. Placing the balloon arm under an object and squeezing the bottle would move the object up.

ASSIGNMENT BOOKLET 1C

Science 8
Module 1: Section 3 Assignment and Final Module Assignment

Home Instructor's and Student's Comments:

STUDENT FILE NUMBER
(if label is missing or incorrect)

_____

Date Submitted:

_____

Apply Module Label Here

Name

Address

Postal Code

Please verify that preprinted label is for correct course and module.

FOR SCHOOL USE ONLY

Assigned Teacher:

_____

Date Assignment Received:

_____

Grading:

_____

Teacher's Comments

_____
Teacher's Signature

Home Instructor: Keep this sheet when it is returned to you as a record of the student's progress.

INSTRUCTIONS FOR SENDING IN THIS DISTANCE LEARNING ASSIGNMENT BOOKLET

When you register for distance learning courses, you are expected to send in Assignment Booklets for corrections regularly. Try to send each Assignment Booklet as soon as you have completed it. Before sending your Assignment Booklet, please check the following:

- Are all the assignments completed? If not, explain why.
- Has your work been reread to be sure the spelling and details are correct?
- Is the record form filled out and the correct module label attached?

MAILING

1. Postage Regulations

Do **not** enclose letters with Assignment Booklets.

Send all letters in a separate envelope.

2. Postage Rates

Take your Assignment Booklet to the post office and have it weighed. Attach enough postage and seal the envelope. Assignment Booklets will travel faster if correct postage is used and if they are in large envelopes that are no more than two centimetres thick.

FAXING

1. Assignment Booklets may be faxed. Contact your teacher for the fax number.

2. All faxing costs are the responsibility of the sender.

E-MAILING

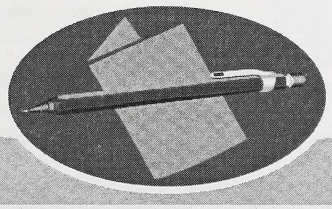
Assignment Booklets may be e-mailed. Contact your teacher for the e-mail address.

Science 8

Module 1

Mix and Flow of Matter

Assignment Booklet 1C



Learning Technologies Branch

Alberta LEARNING

FOR TEACHER'S USE ONLY

Summary

	Total Possible Marks	Your Mark
Section 3 Assignment	20	
Final Module Assignment	32	
	52	

Teacher's Comments

Science 8
Module 1: Mix and Flow of Matter
Assignment Booklet 1C
Section 3 Assignment and Final Module Assignment
Learning Technologies Branch

The Learning Technologies Branch acknowledges with appreciation the Alberta Distance Learning Centre and Pembina Hills Regional Division No. 7 for their review of this Home Instructor's Guide and Assignment Booklet.

This document is intended for	
Students	✓
Teachers	✓
Administrators	
Home Instructors	
General Public	
Other	

You may find the following Internet sites useful:

- Alberta Learning, **http://www.learning.gov.ab.ca**
- Learning Technologies Branch, **http://www.learning.gov.ab.ca/ltb**
- Learning Resources Centre, **http://www.lrc.learning.gov.ab.ca**

The use of the Internet is optional. Exploring the electronic information superhighway can be educational and entertaining. However, be aware that these computer networks are not censored. Students may unintentionally or purposely find articles on the Internet that may be offensive or inappropriate. As well, the sources of information are not always cited and the content may not be accurate. Therefore, students may wish to confirm facts with a second source.

Copyright © 2003, the Crown in Right of Alberta, as represented by the Minister of Learning, Alberta Learning, 10155 – 102 Street, Edmonton, Alberta T5J 4L5. Print copies may be obtained from the Learning Resources Centre. Digital copies are available to registered Alberta educators at the Tools4Teachers website: **http://www.tools4teachers.ab.ca**

Every effort has been made both to provide proper acknowledgement of the original source and to comply with copyright law. If cases are identified where this effort has been unsuccessful, please notify Alberta Learning so that appropriate corrective action can be taken.

ASSIGNMENT BOOKLET 1C
SCIENCE 8: MODULE 1
SECTION 3 ASSIGNMENT AND FINAL MODULE ASSIGNMENT

Your mark for this module will be determined in part by how well you do your assignments.

This Assignment Booklet is worth 52 marks out of the total 136 marks for the assignments in Module 1. The value of each assignment and each question is stated in the left margin.

Work slowly and carefully. If you have difficulty, go back and review the appropriate topic.

Be sure to proofread your answers carefully.

(20)

Section 3 Assignment: Working with Fluid Pressure

Read all parts of your assignment carefully and record your answers in the appropriate places.

Circle the letter of the best response for questions 1 and 2.

(1) **1.** What instrument is used to measure air pressure?

A. a barometer
B. a hydrometer
C. a hygrometer
D. a thermometer

(1) **2.** Which of the following substances is compressible?

A. a glass prism
B. an ice cube
C. nitrogen gas in an automobile airbag
D. water in a plastic bag

(1) **3.** Describe how air pressure changes with altitude.

_____

_____

Return to page 76 of the Student Module Booklet and continue with Lesson 2.

Questions 4 and 5 are based on "Investigation 1L: Compression of Liquids and Gases," starting on page 79 of the Student Module Booklet.

(3) **4.** Match the following. Write the correct capital letter in each appropriate answer blank.

_____	**a.** a controlled variable	A. amount of compressibility
_____	**b.** the manipulated variable	B. type of fluid
_____	**c.** the responding variable	C. size of the force applied tothe plunger

5. You used the percent compression formula $\frac{(A-B)}{A} \times 100\%$.

(2) **a.** How did your percent compression for water compare to the percent compression for air?

_____

_____

(2) **b.** What do you conclude about the compressibility of gases and liquids?

_____

_____

_____

Return to page 80 of the Student Module Booklet and continue with Lesson 2.

(3) **6.** In a hydraulic system, similar to the syringe model used in the "Find Out Activity" on page 80 in the textbook, the cross-sectional area of the main cylinder is 0.250 m^2. Suppose a force of 19.6 N is applied to the piston of the main cylinder.

Use the pressure formula to calculate the pressure applied to the enclosed liquid. Express your answer in pascals. Show all your work, including formulas and units.

(1) **7.** Air brakes are used to stop or slow down large vehicles. How must the air be stored to quickly transfer force through the pneumatic system?

_____

(2) **8.** Study the hydraulic device shown in question 32 on page 93 of the textbook. Suggest two modifications to the syringes that would reduce the effort force required to raise the arm.

_____

_____

9. The Mariana Trench in the Pacific Ocean is 11 km deep. Small underwater craft called submersibles are currently being used to explore and study the trench and its inhabitants.

A deep-sea submersible has a ballast tank that holds sea water or air. The ballast tank is attached through a series of valves to a compressed air tank. Air can move in and out of this tank—this causes water from the ocean to move in and out of the ballast tank.

(2) **a.** Describe and explain any change in pressure that might occur as the submersible descends into the Mariana Trench.

_____

_____

(1) **b.** What forces would be acting on the submersible during a dive?

_____

_____

(1) **c.** Does the water only push up on the submersible? Explain.

_____

Return to page 83 of the Student Module Booklet
and continue with the Module Summary.

32

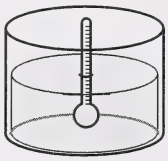
Final Module Assignment

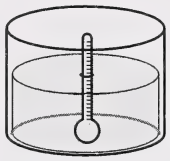
Read all parts of your assignment carefully and record your answers in the appropriate places.

2

1. You use a calibrated hydrometer to check if you put enough sugar in the flavoured drink that you made. You find that the hydrometer floats higher in the drink than it would if the right amount of sugar were added.

The diagram on the left shows your drink, while the graphic on the right illustrates how the hydrometer should float with the correct quantity of sugar.





Did you put in too much sugar or not enough sugar? Explain your answer. Be specific.

_____

_____

_____

3

2. In your own words, describe the role that compressed air has in raising and lowering a submarine in the ocean.

_____

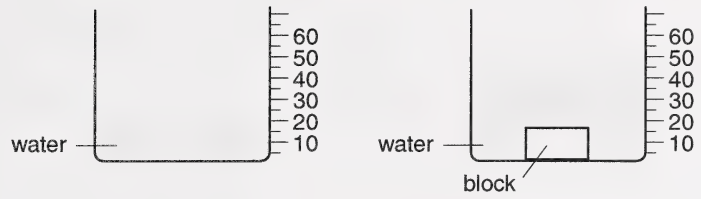
_____

_____

_____

_____

Use the following information to help you answer questions 3 to 7.



Note this data:

- density of water = 1 g/mL
- mass of block = 236 g
- dimensions of block (l, w, h)—5 cm, 2 cm, 3 cm
- 100 g of matter weighs 1 N $\left(\frac{1\text{ N}}{100\text{ g}}\right)$
- 1 mL = 1 cm^3

(1) **3.** Explain why, instead of floating, the block is sitting at the bottom of the container.

(3) **4.** Calculate the density of the block in g/cm^3. Show all your work, including formulas and units.

(1) **5.** Identify what substance the block is likely made from.

(3) **6. a.** Calculate the buoyant force acting on the block. Show all your work, including formulas and units.

(1) **b.** What is the name of the principle you applied to determine the buoyant force?

_____

(3) **7.** Using Pa (N/m^2), calculate the pressure the block would exert on the bottom of the container if there was no water in the beaker. Show all your work, including formulas and units.

8. Apply information from Module 1 to answer the following questions as completely as possible.

You are designing a pipeline to carry a fluid across Canada.

(4) **a.** What are some of the properties of the fluid that you need to consider for the system to have a safe and efficient design? Explain your answer.

(2) **b.** Describe two things that you need to know about where the pipeline is going to ensure it has a safe and efficient design. Why?

Use the following information to help you answer questions 9 to 12.

Solubility of Solute A	
Temperature (°C)	**Maximum Mass That Will Dissolve in 100 mL of Alcohol (g)**
20	14
40	20
60	28
70	34

(1) **9.** What is the responding variable?

_____

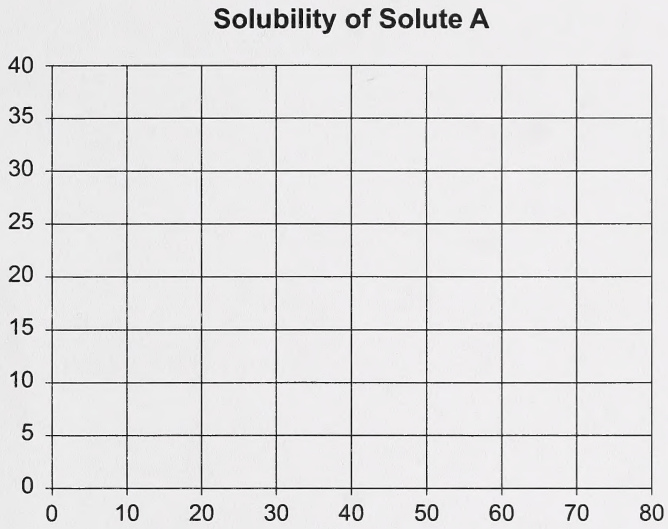
_____

(2) **10.** State the solubility at 70°C.

_____

_____

(5) **11.** Create a proper, scientific line graph using the solubility data. Use the following grid. Label the axes and show the units used. Plot the data and connect the data points with a smooth curve.



(1) **12.** Use your graph to estimate the solubility of Solute A. What is the solubility at 50°C?

_____

Submit your completed Assignment Booklet 1C to your teacher for assessment.

ASSIGNMENT BOOKLET DECLARATIONS

The Student's Declaration is to be signed by a student registered at the Alberta Distance Learning Centre. If the student is under 16, the Supervisor's Declaration is to be signed by the student's supervisor, who is usually a home instructor, teacher, or home-schooling coordinator. Failure to complete this page may invalidate the assignment results.

STUDENT'S DECLARATION

- I have followed the instructions outlined in the Student Module Booklet.
- I have completed the activities to prepare myself for the assignments in this Assignment Booklet.
- I completed the assignments in this Assignment Booklet by myself.

_____

Student's Signature

SUPERVISOR'S DECLARATION

I hereby certify that I have supervised the learning activities completed by _____.

Student's Name

I also certify that to the best of my knowledge the assignments in this Assignment Booklet were completed independently by this student.

_____

Supervisor's Signature

If you, the student or supervisor, have any comments or observations regarding this module, write them in the following space.

_____

_____

_____

_____

_____

_____

_____

_____

_____

© 2003